WHAT IS CLAIMED IS:

1. A gravity gradient measuring system for mounting in a vehicle comprising:

a coarse stage isolation mount adapted to attenuate, above a first low pass cutoff frequency, displacements imparted on said gravity gradient measuring system;

a fine stage isolation mount adapted to attenuate, above a second low pass cutoff frequency, vibrations imparted on said gravity gradient measuring system, where said vibrations are characterized by a minimum frequency, where said second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations, said fine stage isolation mount mounted to said coarse stage isolation mount; and

a gravity gradiometer mounted to said fine stage isolation mount.

2. The system of claim 1 wherein said gravity gradiometer is a crossed dumbbell type gravity gradiometer.

3. The system of claim 1 wherein said coarse stage isolation mount has a first natural frequency and said first natural frequency exceeds said second low pass cutoff frequency.

4. The system of claim 1 wherein said coarse stage isolation mount controls a displacement of said fine stage isolation mount relative to said vehicle.

5. The system of claim 4 further comprising a mobile vehicle wherein said coarse stage isolation mount is mounted to said mobile vehicle and wherein said mobile vehicle comprises a navigation system and a flight control system, said flight control system and said navigation system interacting so as to control a flight path of said mobile vehicle, said flight control system operable by at least one of a human pilot and an auto-pilot system.

6. The system of claim 5 wherein said coarse stage isolation mount communicates with said navigation system, said communication causing said fine stage isolation mount to travel along a flight path that is substantially smoother than said flight path of said mobile vehicle.

7. The system of claim 1 wherein said gravity gradiometer measures gravity gradient components or functions of said gravity gradient components.

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8. The system of claim 1 further comprising:

a mobile vehicle housing said coarse stage isolation mount, said fine stage isolation mount and said gravity gradiometer.

9. The system of claim 8 wherein said mobile vehicle comprises one of an aircraft, a ship, a submersible, a land vehicle and a submarine.

10. The system of claim 8 wherein said coarse stage isolation mount comprises a control system for determining and controlling a position of said fine stage isolation mount in at least one of three translational degrees of freedom.

11. The system of claim 10 wherein said coarse stage isolation mount further comprises a control system for determining and controlling said position of said fine stage isolation mount relative to a smoothed representation of said flight path of said mobile vehicle, where said controlling is constrained by interior dimensions of said mobile vehicle.

12. The system of claim 10 wherein said fine stage isolation mount comprises a control system for determining and controlling a position of said gravity gradiometer in the six degrees of freedom associated with motion of a rigid body.

13. The system of claim 12 wherein said control system of said coarse stage isolation mount directs said fine stage isolation mount towards a home position, where said home position is measured relative to said coarse stage.

14. The system of claim 1 wherein said first low pass cutoff frequency is adjustable according to motion characteristics of a selected vehicle and acceleration response characteristics of said gravity gradiometer.

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15. The system of claim 14 wherein said fine stage isolation mount comprises a control system for determining and controlling a position of said gravity gradiometer in the six degrees of freedom associated with motion of a rigid body.

16. The system of claim 14 further comprising a plurality of transfer functions between said displacements and said vibrations, each of said plurality of transfer functions associated with at least one degree of freedom, and wherein, for each of said plurality of transfer functions, a cutoff frequency is separately adjustable.

17. The system of claim 16 wherein said fine stage isolation mount further comprises:

a base;

a floater magnetically levitated relative to said base, said floater providing a mount for said gravity gradiometer;

a plurality of accelerometers adapted to measure said vibrations ;

a plurality of position sensors adapted to measure a relative position of said floater with respect to said base in the six degrees of freedom associated with motion of a rigid body; and

said base mounted to said coarse stage isolation mount.

18. The system of claim 17 wherein said accelerometers are at least one of linear accelerometers, gyroscopes and rotational accelerometers.

19. An isolation system for facilitating measurement of a gravity gradient in a moving vehicle comprising:

a coarse stage isolation mount adapted to attenuate, above a first low pass cutoff frequency, displacements that are characterized by a first frequency regime, said coarse stage isolation mount including a support platform;

a fine stage isolation mount adapted to attenuate, above a second low pass cutoff frequency, vibrations that are characterized by a minimum frequency, where said second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations, said fine stage isolation mount including:

a base mounted to said support platform ; and

a component whose position relative to said base is variable; and

where a gravity gradiometer can be mounted to said component of said fine stage isolation mount.

20. A system as claimed in claim 19 wherein said first low pass cutoff frequency and said second low pass cutoff frequency are independently adjustable.

21. An apparatus for measuring gravity gradients comprising:

a means for isolating, above a first low pass cutoff frequency, displacements;

a means for isolating, above a second low pass cutoff frequency, vibrations, where said vibrations are characterized by a minimum frequency, where said

second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations;

a gravity gradiometer mounted to said means for isolating vibrations; and

where said means for isolating vibrations is mounted to said means for isolating displacements.

22. The apparatus of claim 21 wherein said means for isolating vibrations is at least one of a pneumatic mount and a magnetically levitated isolation mount.

23. A method for obtaining fine resolution gravity gradient data comprising:

transporting a gravity gradiometer in a mobile vehicle, said mobile vehicle experiencing accelerations and displacements;

in a coarse stage, isolating, above a first low pass cutoff frequency, said accelerations and displacements;

in a fine stage, isolating, above a second low pass cutoff frequency, said accelerations and displacements, where said accelerations and displacements are characterized by a minimum frequency, where said second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations;

tracking a position of said mobile vehicle in the six degrees of freedom associated with motion of a rigid body;

during said isolating said accelerations and displacements in said coarse and fine stages, measuring gravity gradients using a gravity gradiometer; and

tabulating said gravity gradients as a function of said position of said mobile vehicle.

24. The method of claim 23 wherein said tracking comprises:

identifying said position of said mobile vehicle using at least one of an inertial navigation system (INS) and a global positioning system (GPS).

25. The method of claim 24 wherein isolating said accelerations and displacements in said fine stage comprises:

measuring accelerations of a floater magnetically levitated relative to a base, said floater magnetically levitated relative to said base by use of electromagnets;

measuring relative position of said floater with respect to said base; and

compensating for said accelerations through variable application of current through said electromagnets.

26. The method of claim of 23 wherein said isolating of said accelerations and displacements in said coarse stage comprises:

measuring accelerations of said fine stage,

measuring relative position of said fine stage; and

counteracting said accelerations measured through application of counteracting force.

27. The method of claim 26 wherein said isolating of said accelerations and displacements in said coarse stage further comprises:

determining said position of said fine stage relative to said mobile vehicle;

applying forces to said fine stage responsive to said position determined so as to reposition said fine stage towards a home position in, and relative to, said mobile vehicle.

28. A gravity gradient map of a body, said map generated by a general purpose computer adapted to:

receive gravity gradient signals from a gravity gradiometer mounted to a fine motion isolation mount, said fine motion isolation mount mounted to a coarse motion isolation mount, said coarse motion isolation mount housed within a vehicle;

receive position signals tracking a position of said vehicle relative to the earth; and

tabulate said gravity gradient signals as a function of said position signals received so as to generate a gravity gradient map of a portion of the earth.

29. The gravity gradient map of a body of claim 28 wherein said position signals are received from a navigation system.

30. Computer readable media containing data representative of gravity gradients, said data generated by:

transporting a gravity gradiometer in a mobile vehicle, said mobile vehicle experiencing accelerations and displacements;

in a coarse stage, attenuating, above a first low pass cutoff frequency, said accelerations and displacements;

in a fine stage, attenuating, above a second low pass cutoff frequency, said accelerations and displacements, where said accelerations and displacements

are characterized by a minimum frequency, where said second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations; and

during said attenuating in said coarse and fine stages, measuring gravity gradients using a gravity gradiometer.

31. An aircraft generating data corresponding to gravity gradient measurements, said aircraft comprising:

a coarse stage isolation mount adapted to attenuate, above a first low pass cutoff frequency, displacements, said coarse stage mounted within said aircraft;

a fine stage isolation mount adapted to attenuate, above a second low pass cutoff frequency, vibrations, where said vibrations are characterized by a minimum frequency, where said second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations, said fine stage isolation mount mounted to said coarse stage isolation mount; and

a gravity gradiometer mounted to said fine stage isolation mount.

32. A body causing a gravity gradient, said body identified by:

transporting a gravity gradiometer in a mobile vehicle, said mobile vehicle experiencing accelerations and displacements relative to a straight, level, constant velocity path relative to said body;

in a coarse stage, isolating, above a first low pass cutoff frequency, said accelerations and displacements;

in a fine stage, isolating, above a second low pass cutoff frequency, said accelerations and displacements, where said accelerations and displacements are characterized by a minimum frequency, where said second low pass cutoff frequency is greater than said first low pass cutoff frequency and less than said minimum frequency of said vibrations;

tracking a position of said mobile vehicle;

during said isolating in said coarse and fine stages, measuring gravity gradients using a gravity gradiometer; and

tabulating said gravity gradients as a function of said position of said mobile vehicle.

33. The body of claim 32 wherein said body is at least one of:

a mineral deposit;

a volume of gas;

a volume of fluid;

a tunnel;

a cavity;

a porous media containing a gas;

a porous media containing a fluid; and

an artifact.